

WHAT IS CLAIMED IS:

1. A system for processing a signal comprising:

a) a frequency generator for providing an excitation signal to a primary winding of a variable differential transformer;

5 b) means for sampling output voltages from a pair of secondary windings of the variable differential transformer for use in determining the position P of a movable core of the variable differential transformer as a solution to the equation

$$P = \frac{(S1 - S2)}{(S1 + S2)}$$

10 where S1 and S2 represent the output voltages of the secondary windings of the variable differential transformer; and

c) means for conditioning the sampled S1 and S2 output voltages in such a manner so that the sum of the conditioned S1 and S2 output voltages is equal to a constant reference voltage, whereby the position P is equal to the difference between the
15 S1 output voltage and the S2 output voltage.

2. A system as recited in Claim 1, wherein the means for conditioning the sampled S1 and S2 output voltages includes an automatic gain control amplifier.

20 3. A system as recited in Claim 2, wherein means are provided for sequentially switching the input signal to the automatic gain control amplifier between the sampled S1 and S2 output voltages.

4. A system as recited in Claim 1, wherein the means for conditioning the sampled S1 and S2 output voltages includes a first amplifier configured to integrate the sampled S1 output voltage during a first time interval and a second amplifier configured to integrate the sampled S2 output voltage during a second time interval.

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5. A system as recited in Claim 4, further comprising a voltage controlled oscillator for supplying a reference frequency to a time indexer adapted and configured to set output times at discrete time intervals.

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6. A system as recited in claim 1, wherein the means for sampling output voltages includes first and second sample and hold buffers, for sampling and holding precision-rectified S1 and S2 output voltage signals, respectively.

7. A system for conditioning a signal comprising:

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a) a frequency generator for providing an excitation signal to a primary winding of a variable differential transformer;

b) a voltage controlled oscillator for supplying a reference frequency to a time indexer adapted and configured to set output times at discrete time intervals;

c) means for sampling output voltages from a pair of secondary windings of the variable differential transformer for use in determining the position P of a movable core of the variable differential transformer as a solution to the equation:

$$P = \frac{(S1 - S2)}{(S1 + S2)}$$

where S1 and S2 represent the output voltages of the secondary windings of the variable differential transformer;

d) a first integrator operatively associated with the sampling means for integrating the S1 output voltage during a first time interval and the S2 output voltage during a second time interval;

e) means for determining a sampling error during the second time interval based upon the total integrated value of the S1 output voltage and the S2 output voltage;

f) a second integrator for integrating the sampling error during a third time interval so as to generate a value for adjusting the reference frequency supplied by the voltage controlled oscillator so that the total integrated value of the S1 output voltage and the S2 output voltage remains equal to a constant reference voltage; and

g) means for resetting the first integrator during a fourth time interval, whereby the first integrator integrates the S1 output voltage during a fifth time interval and a negative S2 output voltage during a sixth time interval, such that the output of the first integrator during a seventh time interval is the integrated value of the difference between the S1 output voltage and the S2 output voltage of the secondary windings which is used in the solution of the equation, the denominator of which is equal to the constant reference voltage.

8. A system as recited in Claim 7, wherein adjustment of the reference frequency supplied by the voltage controlled oscillator results in an adjustment of the duration of the discrete time intervals, such that the integration time of the first and second integrators is adjusted.

9. A system as recited in Claim 7, further comprising means for generating a reference voltage.

10. A system as recited in Claim 8, wherein the sampling error is determined when the total integrated value of the S1 output voltage and the S2 output voltage is less than or greater than the reference voltage.

11. A system as recited in Claim 9, wherein the sampling error is determined by subtracting the output voltage of the first integrator from the reference voltage.

12. A system as recited in Claim 8, wherein the first integrator is reset during the fourth time interval with a voltage obtained by dividing the reference voltage in half.

13. A system as recited in Claim 7, further comprising means for detecting whether the value of the integrated sampling error drifts beyond a predetermined limit.

14. A system as recited in Claim 7, further comprising means for converting the excitation signal from alternating current to direct current.

15. A method of conditioning a signal comprising the steps of:

- a) generating an excitation signal to a primary winding of a variable differential transformer;
- b) sampling output voltages from a pair of secondary windings of the variable differential transformer for use in determining the position P of a movable core of the variable differential transformer as a solution to the equation

$$P = \frac{(S1 - S2)}{(S1 + S2)}$$

where S1 and S2 represent the output voltages of the secondary windings of the variable differential transformer; and

- 5 c) conditioning the sampled S1 and S2 output voltages in such a manner so that the sum of the S1 and S2 output voltages is equal to a constant reference voltage, whereby the position P is equal to the difference between the S1 output voltage and the S2 output voltage.

10 16. A method of conditioning a signal comprising the steps of:

 a) providing an excitation signal to a primary winding of a variable differential transformer;

 b) supplying a reference frequency to a time indexer adapted and configured to set output times at precise time intervals;

15 c) sampling output voltages from a pair of secondary windings of the variable differential transformer for use in determining the position P of a movable core of the variable differential transformer as a solution to the equation:

$$P = \frac{(S1 - S2)}{(S1 + S2)}$$

20 where S1 and S2 represent the output voltages of the secondary windings of the variable differential transformer;

 d) integrating the S1 output voltage during a first time interval;

 e) integrating the S2 output voltage during a second time interval;

f) determining a sampling error based upon the S1 and S2 output voltages during the second time interval;

g) integrating the sampling error during a third time interval;

h) adjusting the frequency of the voltage controlled oscillator based on the integrated value of the sampling error so that the total integrated value of the S1 output voltage and the S2 output voltage remains equal to a constant reference voltage;

i) resetting the first integrator during a fourth time interval;

j) integrating the S1 output voltage during a fifth time interval;

k) integrating the negative S2 output voltage during a sixth time interval;

l) providing the output of the first integrator during a seventh time interval which is the integrated value of the difference between the S1 output voltage and the S2 output voltage of the secondary windings which is used in the solution of the equation, the denominator of which is equal to the constant reference voltage; and

m) resetting the first integrator during an eighth time interval.

17. A method according to Claim 16, further comprising the step of generating the reference voltage.

18. A method according to Claim 16, wherein the sampling error is determined when the total integrated value of the S1 output voltage and the S2 output voltage is less than or greater than the reference voltage.

19. A method according to Claim 16, wherein the sampling error is determined by subtracting the output voltage of the first integrator from the reference voltage.

20. A method according to Claim 16, wherein the first integrator is reset during the fourth time interval with a voltage obtained by dividing the reference voltage in half.

5 21. A method according to Claim 16, further comprising the step of monitoring whether the value of the integrated sampling error drifts beyond a predetermined limit.

22. A method according to Claim 16, further comprising the step of converting the excitation signal from alternating current to direct current.

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